DRIVER

JULY 1979

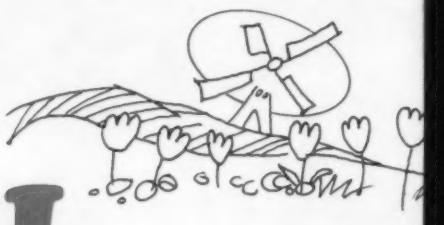
LIFE in the SLOW LINE

VAN pooling

how it's done at Offutt AFB

DRiVER

Lela Howard, a dependent who works at Offutt, leaves the van at her driveway in Capehart, a military housing area near the base. The vanpools provide commuting service from the rider's front door to the door of his or her building at work.



In an effort to interest more of you in the benefits of pooling, your loyal DRIVER editors have spared no expense in bringing to you this interview with the father of ride-sharing, Dr. Cornelius Van Pool. We found Dr. Van Pool in his home in Amsterdam, the Netherlands. He is a citizen well-respected for his innovative ideas in a country that understands very well the value of space. He is somewhere around 60, balding, with a thick handlebar moustache. He dresses invariably in tweeds and smokes a long-stemmed briar pipe.

DRIVER: It was very kind of you to allow us this time to talk to you, sir. How did you first get the idea for ride-sharing?

VANPOOL, Anyone?

Cooperative Conservation, Part II

Van Pool: It was some years ago. You have of course noticed we Dutch do not have vast areas of land – in fact we have to keep draining the Zuider Zee to get land to build a McDonald's on. There is limited space to build highways and limited space to set aside for parking lots. But I decided that those of us who don't like to ride bicycles should have an alternative, and since we have to limit the number of motorcars, we should put more people in each one. Ride-sharing turned out to be a very popular idea.

DRIVER And it was named after you.

Van Pool: (laughs) Yes. They called ride-sharing "Van Pooling," and then later other cooperative efforts were called "pooling." Finally, those little vehicles that look like small buses were called "vans," after me.

DRIVER Not many in America are aware of this, and we're glad to set things straight.

Van Pool: That's very nice, but my main interest is in promoting the idea of ride-sharing – or van pooling, if you will – to other countries. From my travels in the United States on my lecture tours, I have seen the long distances some people have to commute just to get to work. What some of you drive every day would equal a good vacation for a Hollander! And all those automobiles with only one person in them! Doesn't that get lonely?

DRIVER Sometimes. What are some of the advantages you see in vanpooling for Americans?

Van Pool: Well, first of all it would get a lot of those autos off your highways. For a country with as much space as you have, you suffer from a horrible congestion on your roads. Put 10 to 15 people in each vehicle – vans, of course – and you would solve this problem.

DRIVER That's very true. What else?

Van Pool: You could cut down on your use of fossil fuels. The United States uses more petroleum per person than any other country in the world. And you've probably noticed it's

continued

DRIVER

THE
TRAFFIC SAFETY MAGAZINE
FOR THE MILITARY DRIVER

DEPARTMENT OF THE AIR FORCE
HQ AIR FORCE INSPECTION AND SAFETY CENTER
Norton Air Force Base, California 92409

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PUBLISHED MONTHLY IN COOPERATION
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AFRP 127-1
Controlled Circulation Permit number
USPS 448-630

SUBSCRIPTION – DRIVER is available on subscription for $12.00 per year domestic ($1.00 per copy); $15.00 per year for foreign mailing ($1.25 per copy), through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Back issues are not available. Changes in subscription mailings should be sent to the above address. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. No payment can be made for manuscripts submitted for publication. Contributions are welcomed, as are comments and criticism. Address all correspondence to the Editor, DRIVER Magazine, AFISC/SEDD, Norton AFB, CA 92409.

ATTENTION DEPT OF THE NAVY PERSONNEL: Address all queries concerning distribution to NAVSAFECEN, NAS, NORFOLK, VA 23511, Attn: Safety Publications Dept. All other correspondence will be welcomed by the Editor.

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JUL

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THE EDITOR SPEAKS DOUBLE CLUTCH

50,000+!

In the time it takes you to read a single page of this magazine, one person will be killed in an automobile accident in this country and over 100 others will suffer disabling injuries. Last year traffic fatalities in the United States soared over 50,000 for the first time since 1973.

NHTSA (National Highway Traffic Safety Administration) credits the nation's relatively good years—1974 through 1977—to the 55 mph speed limit, and blames the recent increase in fatalities on the fact that motorists are again driving faster than that. But many people attribute our good years to other things: Increased use of seat belts. Cars with better brakes and handling. Proportionately fewer 16- and 17-year-old drivers in the population. Better traffic education programs. Improved traffic controls such as lights, road markings, and other signs. Judges getting tough on drunk drivers. There are plenty of theories.

Everyone agrees that 51,900 highway fatalities in 1978 is a national tragedy. But some will point out that we had many more cars and drivers on the roads in '78, traveling many more miles than in any previous year. That's true. So a more meaningful figure may be the MDR (Mileage Death Rate), measured by the number of fatalities per 100 million vehicle miles traveled.

The MDR decreased almost steadily from 1950. In fact, if the rate had continued at the '50s level, fatalities last year would have been almost 115,000 people, more than twice the actual figure! Unfortunately, the MDR turned upward in 1977 and again in 1978. The MDR is far from perfect as a measure

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vanpool, anyone?

continued

The Offutt vanpools are provided with special reserved parking close to the work areas of the drivers. This is only one of the conveniences provided to the ride-sharers.

getting harder and harder to obtain. Besides that, there are advantages for the riders in a van pool. They can be picked up at their homes and delivered right to their office buildings in the morning, and then delivered back to their front doors at night. They can leave their homes and get into a climate-controlled van and not have to worry about warming up the vehicle or driving it to work or parking. The passengers can read or sleep or eat or do paperwork, or just listen to music and watch the countryside.

DRIVER There are advantages for the employer too, aren't there?

Van Pool: Oh yes, indeed there are. The employer gets workers who come in fresh and ready to work, because they didn't have to fight traffic, and I know that can be frightening over there. His workers are very punctual, because they arrive at the same time and leave at the same time each day. If one employee is habitually late, he will be forced to be punctual, just to ride along. The employer can provide less space for parking if many of his workers pool to work. As for the workers, they have other advantages besides the ease with which they get to work. They use less gasoline because they do not drive to work. They put fewer miles on their automobiles, which makes them last longer. And they may get lower premium rates on their auto insurance. They could even get by with fewer automobiles per family – something that you Americans should by all means attempt to do.

DRIVER With all these advantages, for all the people involved in any van pooling effort, why haven't more people done it?

The fifteen-passenger vans are spacious and comfortable. All were ordered with extra heating and air conditioning systems for the benefit of the riders.

Van Pool: Oh, they are – more all the time. Many large American industrial companies are van pooling. But perhaps you haven't heard about them. What the idea needs most apparently is more publicity. The employers must promote the idea and make the advantages known to their workers.

DRIVER Can you give us a good example of this?

Van Pool: Yes, and one that is very much to the interest of your publication. The United States Air Force base at Omaha, Nebraska, Offutt Air Force Base, has a very good example of the kind of organization that should be built up to promote ride-sharing. The military command there has become enthusiastic about the idea of van pooling and they have provided the support that it needs to be successful. I understand some of the employees have formed a corporation that has purchased vans for commuting. I suggest you contact them for information, because I understand there are special considerations to be examined when the employer is the United States government . . .

We checked with Offutt AFB and discovered that they did indeed have a successful, large-scale vanpooling effort. The organization goes by the name Offutt Van Pool, Inc. Presently there are 148 members of this non-profit corporation who ride to and from work in nine vans. Each van holds a maximum of 15 passengers, and two of the vans make double trips each morning and evening.

These nine vans have therefore eliminated nearly 100 cars that were previously driven to work. Further, the vans save about 35,000 gallons of gasoline per year. The estimated 30,000 gallons saved in 1978 (when there were only eight vans) equalled about seven percent of the total energy savings in the state of Nebraska for that year. The vanpool members are especially proud of this figure.

The fares paid by the riders, which pay for the vans themselves, are based on the number of riders in each van. The present vans are close to their

continued

vanpool, anyone?

continued

capacity, and some of the vans even have waiting lists of prospective riders. So the only way to expand the organization is to obtain more vans and recruit riders for them. This is what the Offutt Van Pool, Inc., plans to do.

The maintenance of the vanpool is fairly simple, and the time expended these days by its program manager, Major Ed Marks, is minimal. "Right now I'm probably down to less than one hour a day," he says.

But the time spent on setting up the organization in the first place – and the planning and research before that – was considerable. That's where the comments of our friend Dr. Van Pool come in: Prospective vanpoolers will run into difficulties when their employer is the United States govern-

(right)
This homely little reminder was found in the office of the Offutt Van Pool, Inc., a tribute to the value of vanpools for the conservation of the nation's supply of petroleum.

John Schunke, of the vanpool staff, explains the duties of a driver to 2nd Lt Don McCanless. McCanless was just taking over as primary driver, after having been back-up driver.

Major Ed Marks, program manager for the vanpool, has been active in all phases of the operation, from planning to administration to publicity and advertising.

ment. That's why it is good that the Offutt Van Pool organization handled the problems others might encounter. And this is why we're going to look at their efforts.

To boldly go where no van has gone before: In 1976, Offutt AFB was becoming aware that they needed some new approach to handling the herds of automobiles that entered the base every day. There just weren't enough parking places for them, and even with maximum carpooling efforts they were going to run short.

The base became interested in the idea of van pooling. This idea had been used very successfully in various private industries and civilian corporations. For instance, a company-owned program at Chrysler Corporation in Detroit has 120 vans and 1200 riders. A problem that made the drive toward a vanpooling program on the government installation more difficult was a law that prohibits the use of appropriated funds for commuting federal employees.

Offutt's hope was to discover a way that all federal installations interested could adopt a vanpooling program. They tried to obtain funds through the Federal Aid to Highways Act, but found that other programs had precedence over vanpooling projects. Other ideas also had to be rejected.

However, our purpose here is not to tell how Offutt failed to establish its vanpool, but how it succeeded. So let's back up to some basics.

Van basics: There are three general types of vanpool operations. One is the company-owned van. The company buys a van, does all the administrative duties and chooses a driver. The fees paid by the riders cover all or a part of the costs incurred by the company. This idea could not be used at Offutt because of the federal law that prohibits expenditure of appropriated funds for commuting of employees.

A second method is an outside party who provides vanpool service to the company (or several companies). The service either operates for profit, or the companies may share in the costs. This method, of course, can only be employed where there is in existence such an organization.

The third possibility is an employee of the company who buys a van and operates the pool himself. He charges fares to cover the buying and operating of the van for the percent used for commuting.

The third method is the one chosen by Offutt – with a variation. In the form given, this method puts all the responsibility for the success of the vanpool on one individual, the driver/owner. He carries a large insurance burden if there is an accident. Also, military people are transferred quickly and a military van-owner might PCS with the van and leave the other poolers on foot. Therefore Marks made the decision that the vanpool should incorporate itself, to provide some stability and some legal protection.

Van planning: This decision to incorporate was made in early 1977, but there was still a lot of work that had to be done before the program could begin. Offutt's vice commander, Col James Bennington, a man who was solidly behind the idea of vanpooling, arranged staff meetings to answer questions on the subject. These meetings included representatives from the comptroller, transportation, judge advocate, command and information, among others. As Bennington said, their purpose was to "wind our way through the regulations and laws of not only the local, state and national level, but also of course the military.

"There's only one objective to getting these people together and that's to find out how you can do it," said Bennington. "And it can be done. I thought it would take a year to do it, and it took only six months."

Aside from the many laws that had to be considered, and the many government agencies that had to be consulted, one of the chief difficulties was that vanpooling was a new idea. A lot of objections had to be overcome.

"Every day we found many, many ways we couldn't do it," said Bennington, "but we resolved them. We finally found a way to do it, and that way was by financing the vans locally."

The command continued its interest in vanpooling and kept its staff working on any difficulties.

Support your local vanpool: "The crucial element is command support," said Bennington, adding that the commanders will have to do more than just "pull levers."

"Command support has to go a little further than that, in that someone is going to have to be designated on at least a part-time, if not a full-time basis, to get the program rolling. You can see downstream somewhere where this will back off, where the time requirement to establish the program is much greater than the time requirement necessary to keep it running. So that means essentially that somebody's got to 'take it out of their hide' to get the program going."

Major Ed Marks was the one who was appointed to be the program manager for the vanpooling effort, to "get the program going." He agrees that a full-time person may be necessary for the administration of a van pool.

He said, "When you get 10 to 15, or especially 20 to 25 vans, you will need a full-time person to take care of them. If you're doing it strictly on the private basis of a private organization or corporation, their fund structure will have to be built up to provide the salary for an employee – unless the Air Force or the government or somebody comes across and says, 'This is a needed thing in the interests of energy conservation. Yes, we will make manpower available to handle the administration of it.' "

A full-time employee for the maintenance of the van pool would not add much to the cost of the ride, Marks said. "Say you had 50 vans and you averaged 12 people a van. That's 600 people. You could probably get a reasonable employee to do the day-to-day administrative stuff, and it would cost each individual I'd say a dollar and a half a month. That gives you $900 a month, $11,000 a year. You would not expect him to be management, in the sense of serious policy-making – not at that salary."

This brings us back to the command support and the lending of manpower. "You can't do it without support at the top," Marks said.

Van fares: Through the efforts of the command staff and Major Marks,

continued

vanpool, anyone?

continued

MSgt Nate Seitelbach is the original driver of Offutt's Van No. 1, and he still drives. When he discovered the van was *never* full, he began "overbooking"—signing up 16 people for a 15-passenger van.

TSgt Chuck Reynolds spends two and a half hours in his van every day making double trips to get riders to work in the morning and home at night. He said in event of "snow call," when the employees at Offutt are released because of bad weather, the vanpoolers are released first.

the vanpool got on the road in May 1977 with three vans. Since then the fleet has grown to nine. Eight of the vans are being financed and the ninth is leased.

This is the way the pool works for the corporation's members. There is a five-dollar membership fee to join. Thereafter, the members of each vanpool pay a fare each month that covers the fixed costs of the van—the loan (or lease), interest, insurance, registration, taxes—and the operating costs—gas, oil, maintenance, tires, etc. The fares they pay range from $15 to $30, depending on the area they commute from.

The driver of each van rides free for his service, since he drives at all times, unless he is ill or on leave. In addition to this, he has the use of the van, on a monthly mileage basis—he is given an allowance of five miles personal use of the van for each day he drives. He may either use these miles or receive a cash payment of 13 cents for every mile of his allowance he does not use.

After the vans are paid off the corporation will be left with a choice of trading them in on new vans or continuing to operate the van pool with paid-for vehicles. When the lease is up on the ninth van, they can either turn it in for a new one, or pay off the balance and own the van.

The best van: Marks believes leasing is the best method to use in the case of a non-profit corporation like the Offutt vanpool, because it will provide a lower cost per month for the van. However, he also said, "I think the ideal way is if there's a large third-party operator who would be happy to come into your facility and provide service to your people." The third party would handle all the organization and administration and take the burden off the military installation. However, as we've mentioned, these services are not available everywhere.

To make future government vanpooling operations simpler to accomplish, vanpooling organizations are pushing the government to change the law that prohibits spending appropriated funds for commuting federal employees, and to set up funds to finance government vanpools. It is still a question whether these efforts will succeed. Until that time, the work that was done by the Offutt Van Pool, Inc. will stand as the best method of organizing vanpools for military installations.

Major Marks and the Offutt Van Pool office receive many calls each week from other installations requesting information about their operations. If your base is interested, you can call them at (402) 294-3571, or Autovon 271-3571. They will be happy to give you any additional information.

the riders speak

The people who are involved in the Offutt vanpool think it is a great idea. 2nd Lt Don McCanless, who was just arranging to take over as the driver of his pool, called it "terrific." He said his auto insurance had gone down $40 a year when he quit driving his car to work.

MSgt Robert Dorsey, the driver of another of the vans, said, "I love it. I'm sold on it 100 percent. We had two cars, and when I joined the vanpool we took those two cars and traded them in on one new one. It's saved us quite a bit of money. We don't have the insurance or anything on the second car. It's like getting a pay raise. And now that I'm driving, of course the drivers get certain benefits. I ride free, in addition to a certain number of miles a month personal use of the van. So that was another 'pay raise' when I started driving."

Another rider who has sold a second car is 2nd Lt Rich Bensinger. He said, "I think it's a great idea. I ride the van now pretty much as a primary vehicle. I still have a motorcycle that I take to work on some days when the van would be inconvenient, when I have to be there early or late. For the most part, you can't beat it—especially in winter. This is my first winter in Nebraska and I'm glad I didn't have to do the driving on some of those January mornings. Door-to-door service is extremely nice."

TSgt Chuck Reynolds drives one of the vans that make two trips each morning and evening, and he must take about an hour and a quarter each time he drives. But despite this, he has never been late to work and he is enthusiastic about the vanpooling idea.

He said, "They're going to have to break some people loose from the image of having to have their own car and being able to go where they want when they want, and getting them started using more mass transit. I think vanpooling is one of the easiest, most convenient ways of doing it. You're not going to be able to run a big bus with door-to-door service. But with this size vehicle you can pick them up right at the door at home and run them right to the door where they work."

continued

vanpool, anyone?

continued

And, oh yes: TSgt Reynolds has also sold his second car. "Right now," he said, "basically the van *is* my second car."

Mrs. Kathy Malt is the back-up driver for one of the vans, and she insists that her vanpool is the best one. She especially enjoys the camaraderie of the vanpool riders. "It's like a big family," she said. "You get a lot of good conversation, like on the gasoline prices and how it's raising *our* prices. And we do a lot of teasing, but none of it's serious. If they tease me about my driving, I just tell them to 'sit on it' or something."

As an aside, she said she first learned about "happy hour" from the vanpool. The vanpool driver had the responsibility for getting the others home safely after they'd been to the club.

That's an idea we hope will catch on, just like vanpooling itself.

a farewell to Corney

Thank you, Herr van Pool. A most timely and informative presentation.
Yer darn right, Charlie! Choin a vanpool und save a bundle of PETROBUCKS$
Those OPECs'll get so shook, they change der name to OH, HECKS!
CHORTLE
CHORTLE
CHORTLE!
CHORTLE
OH! That's a real knee-slapper, Corney!
HAR DE HAR HAR!
Dot Charlie deserves $1.00 a gallon gas.
Vell, hang in there, Yank. I gotta go check out dumb Peter.
Peter? Peter at the dike?
Dot's der vun. If dumb Peter ever takes his finger outta dot dike . . . ve gots instant boat pools!
KELLEHER
. . . und "BOAT POOLS" don't gots dot classy sound like "VAN POOLS"

Timely Topics

ON A SHAKY NOTE

A study by the National Transportation Safety Board has noted that poorly secured appliances and furnishings in customized vans can break loose in traffic accidents, injuring or killing the occupants. Many van owners install their own equipment, yet there are no standards or specifications on how to install or secure this equipment to the van structure. The agency has called on NHTSA and the Recreation Vehicle Industry Association to come up with methods of improving occupant protection and for the Association to amend its standard to specify these methods. *(Autoweek)*

SIMPLIFIED FUEL INJECTION COMING

Carburetors are scheduled to gradually disappear from most U.S. cars in the next few years and be replaced by a new type of fuel injection, reports the Automotive Information Council. Replacing the traditional carburetor on these cars will be a throttle body fuel injection (TBFI) system for atomizing the gasoline and mixing it with air for combustion.

Starting this year, the Cadillac Eldorado and a few other key General Motors cars were introduced with this fuel injection. If all goes well, many of GM's cars will have similar systems in 1981. Ford Motor also will be adopting fuel injection in the coming years, and the other companies are staying abreast of the development.

Throttle body fuel injection is a slightly simplified and less costly version of traditional fuel injection. Most of today's fuel injection systems inject a precise amount of fuel into each cylinder.

With TBFI, the fuel is electronically injected into a rather conventional manifold by two injectors located in a throttle body that looks a bit like a carburetor. Air is mixed with this atomized gasoline as it rushes through a venturi, or reverse funnel, in the throttle body.

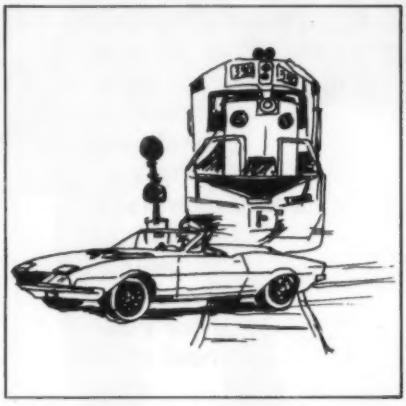
The basic throttle body is similar to the carburetor in performing its throttling function, but the fuel bowl, the fuel channel and the metering rods are removed. The system is controlled by a microprocessor or electronic control unit which constantly receives signals from sensors that report engine speed and load and the kind of pollutants in the exhaust.

GM and probably Ford will combine their new injection systems with closed-loop three-way catalytic emission systems which are now being field-tested on several thousand California cars.

CARBON MONOXIDE POISONING

What's colorless, odorless, hangs around cars and is a silent killer? Carbon monoxide, that's what, and *it causes about one-half of all fatal poisonings in the U.S.* Never warm up your car in a closed garage. And it's a good idea to always keep a window cracked, even in cold weather. An exhaust system that isn't working properly can allow fumes to leak into the passenger compartment. Have your exhaust system checked regularly.

The symptoms of carbon monoxide poisoning are dizziness and headache, something like having a cold or the flu. You become drowsy, then pass out. The antidote is fresh air.



WATCH OUT FOR TRAINS

It takes a passenger train with eight cars 3,500 feet to stop, on the average, if the train is going 60 mph. For a 150-car freight train, traveling only 30 mph, the stopping distance is 3,150 feet. Crossing accidents are often the result of a driver misjudging the train's speed and thinking he'll beat it. The point is, there's no margin of error. *Trying to beat a train is like playing Russian roulette with five bullets in the gun.*

CAR'S SECRET WARRANTY

When you buy a brand-new car, you're given a warranty that covers repairs for a certain amount of time and mileage—for example, 12,000 miles in one year. However, you're probably not aware that automobile manufacturers sometimes extend the warranty on certain cars or certain car parts. This type of extension (called "policy adjustment" by the manufacturer or "secret warranty" by consumer groups) is publicized in bulletins sent to car dealers but not to the consumer. You can end up paying for car repair work unnecessarily.

Here's an example of how these adjustments work. Recently a major automobile manufacturer decided to cover repair work on transmissions and radiators of cars produced during a three-year period that had been driven up to 50,000 miles. (Many owners had had problems with these parts.) If you owned one of these cars, you would not know of the policy adjustment unless you complained to the dealer—and he decided to tell you.

At present, the Center for Auto Safety has petitioned the Federal Trade Commission to require manufacturers to publicize this information to car owners affected by it. If you think your car might be covered, start by checking with your dealer or the regional customer-relations office of the manufacturer (see your owner's manual). You can write to the Center for Auto Safety at: 1223 Dupont Circle Building, Washington, DC 20036 or call them at (202) 659-1126.

TIRES NEGLECTED

Nine of 10 cars have improperly inflated tires and one in five cars has at least one worn-out tire, says a survey by Goodrich, which checked 1,916 tires in six markets. Firestone recently started a campaign to educate car owners on the need for proper air pressure and is installing air pumps for the public at dealerships.

DOUBLE CLUTCH

continued from page 2

of highway safety, but at the moment it's the most widely used record of experience. And it is beginning to tell us bad things.

Is NHTSA right? Are higher speeds the cause? Are fewer people using their belts? The Department of Transportation says yes, only 14% are now routinely buckling up. That's a significant drop from earlier years. Are other factors at work that haven't been identified?

One bright spot in all this gloom—Air Force people are NOT following the national trend toward increasing numbers of traffic fatalities. You readers out there are doing something very right! Keep it up.

EXERCISES for the BACKWARD MECHANIC

With tongue planted firmly in cheek, we bring you some exercises that will hopefully prepare you for your next stint as a backward mechanic.

From time to time, we change the format of the Backyard Mechanic from a straight info-type article to a humorous weird-type take-off called the Backward Mechanic. All human endeavors sometimes lend themselves to this type of parody, and the Backyard Mechanic is no exception.

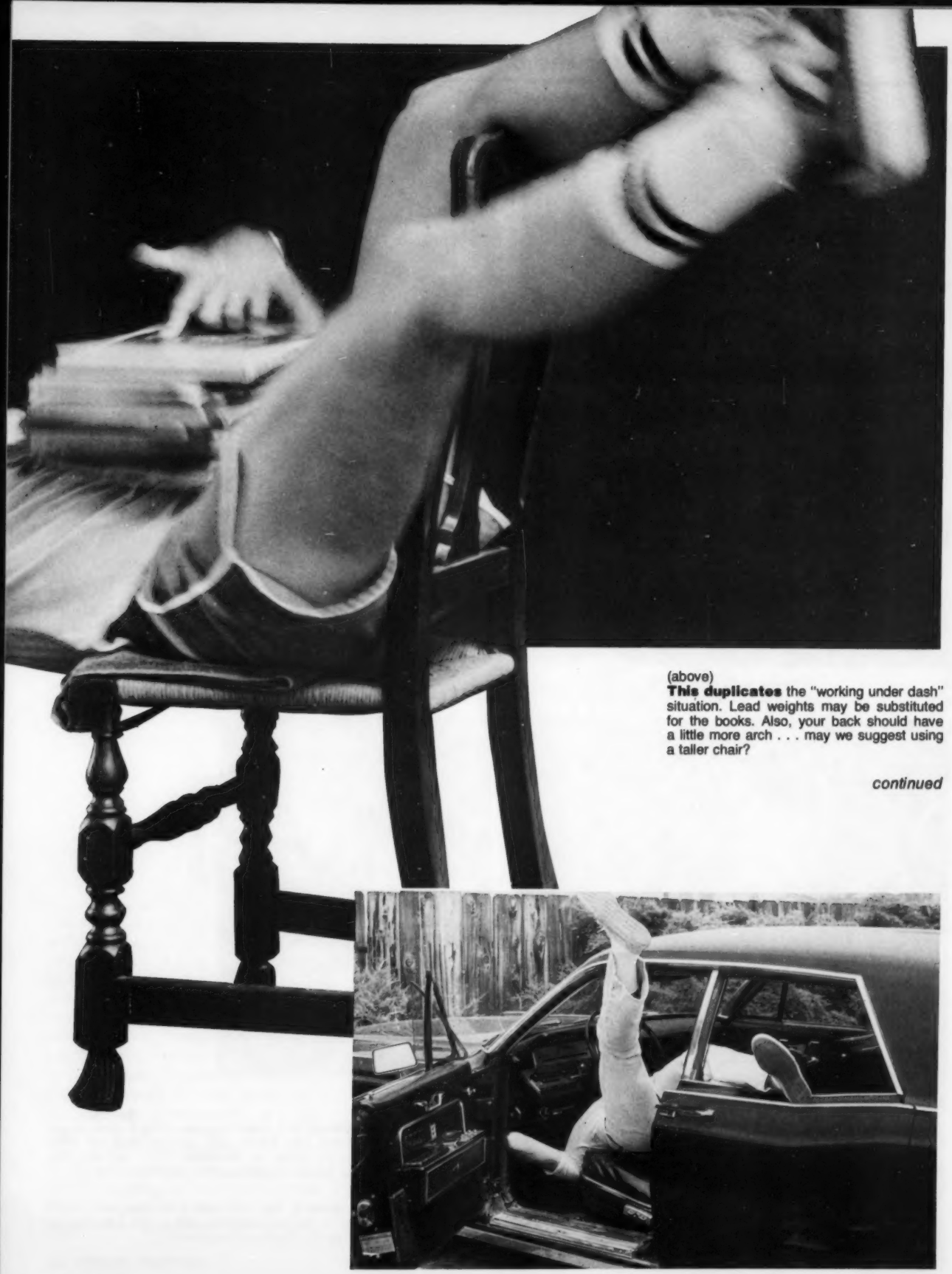
With this fact in mind, kindly consider that this month's BYM is such a column. You will (we hope) find it amusing, but there is a safety message that should peek out at you, too.

If any of the real-type situations we've depicted happen to you, don't say we didn't warn you. But to drive home the point that backyard mechanic activities can sometimes draw a little blood, we've included some "exercises" that you can do in the privacy of your own home in preparation for actually hurting yourself doing your BYM trick.

Again, please remember that all of these photos are posed, and that if you actually try any of them, you'll probably be sorry.

The outdoor photos depict the real-world things that can happen to you, and the following in-studio pix show how you can prepare for these occurrences. We hope you learn a few things, and have a laugh or two, but remember . . . IT'S ALL A JOKE. OK, GANG?

(far right)
When you're working under the dash, sometimes this is the only way to see what you're doing. This can lead to strains of the back, neck, upper arms and shoulders, and the steering wheel can bruise your tum-tum.



(above)
This duplicates the "working under dash" situation. Lead weights may be substituted for the books. Also, your back should have a little more arch . . . may we suggest using a taller chair?

continued

continued

(left)
Trying to get a spare tire or other heavy object out of a deep trunk can do bad things to your lower back. Probably won't help improve your vocabulary, either.

(above)
If possible, the bag should contain something very heavy, like a baby hippo. If the hippo is not available, use old "3" OERs or issues of the *L.A. Times*. Back should be at a 90-degree angle for true agony.

(left)
And speaking of things that make you say *&¢%$, how about pushing a wrench? If your little fingers slip, your knuckles will take the rap (so to speak). Try pulling on wrenches . . . if you slip, it's much easier to get your hands stopped before they hit something.

(above)
This one can get messy, so do it over a newspaper. To get really close to the feel of skinned knuckles, add a little axle grease to the grater . . . voila, instant Backward Mechanic!

continued on page 22

learning to love the ping

Drivers have long been taught to be alarmed by engine knock or pinging. And as a matter of fact engine knock can be caused by serious problems like overheating, a badly adjusted carburetor, incorrect timing, or by deposits in the cylinder head or on top of the pistons. The most common cause, though, is the use of gasoline with an octane rating "too low" for the engine. Instead of burning smoothly, a portion of the gas/air mixture explodes spontaneously and prematurely in the cylinders.

Most of us grew up on car ads praising the quiet hum of the engine. So it's a little shocking to hear Detroit now telling us that we should learn to like those little knocking and pinging sounds. Both General Motors and Ford say knocking will not damage most car engines and can indicate a car is operating at maximum fuel efficiency!

So why has something that was considered intolerable for years suddenly become not just OK but actually desirable? In two words: gas shortage.

What is octane? As we said before, an engine pings when it is running on gasoline with an octane rating lower than it needs to run quietly. But that doesn't mean that the octane rating is a measure of either power or quality. The octane rating of gasoline is simply a measure of its ability to prevent knocking.

In the past, cars equipped with increasingly more powerful engines required gasoline with increasingly higher octane ratings. Refiners accomplished that principally by adding small amounts of knock-retardant chemicals, especially tetraethyl lead. But in 1975 increasing concern about air pollution began to reduce lead's role as an additive. Lead fouls catalytic converters and converters are of course the devices put into cars beginning in 1975 to control air pollution.

Refiners were then faced with the problem of producing gasoline without lead additives that nevertheless carried the generally higher octane ratings the engines required. And that involved a different refining process – one that took more oil to produce a gallon of gas. This was bad news at the very time

continued

continued

crude oil was becoming more scarce and expensive. The news hasn't gotten any better.

How octane is measured: There are three ways of designating the octane rating of gasoline. Research octane is determined by testing gasoline in laboratory engines running at low speeds and tends to give high octane numbers, roughly 100 for premium and 94 for regular.

Motor octane is determined by testing gasolines in engines running at higher speeds, yielding lower numbers: roughly 92 for premium and 86 for regular.

A newer rating uses an average of the two figures (Research plus Motor divided by 2 or (R+M)/2, roughly. The average figure (R+M)/2 is the rating the Federal Trade Commission now requires on every gas pump. Look at the pump for a yellow label.

Octane numbers vary somewhat in different sections of the country (at higher altitudes a lower octane is required). But you can generally be sure that premium has the highest octane; regular lies in the middle range; and economy, subregular, and certain of the low-leads lie in the lowest range. Unleaded is a comparatively low octane fuel.

What manufacturers say: A General Motors engineer says, "The subject of vehicle octane requirements is an issue that needs to be put in proper perspective. In the past, the public has been taught that completely knock-free operation was desirable. However, such practices are wasteful of our nation's energy resources.

"Car owners should tolerate light, infrequent knock because it indicates the maximum fuel economy is being obtained from the gasoline's octane quality. The buying of higher octane gasoline is an unnecessary expense."

The oil companies feel much the same way. A Union Oil executive says anything that helps decrease the current shortage of gasoline is a good thing, and a decrease in the octane rating of unleaded fuel nationwide could be significant.

"Knock is not a serious problem," he says. "People have trained themselves to not tolerate it. You get knock when you're an aggressive driver, when you slam your foot on the pedal to accelerate. People could retrain themselves to start slowly."

Nevertheless, the oil companies are afraid that unless all companies lower octane ratings at the same time, the companies that do it first will lose their customers to the brands which continue to supply a more satisfying octane.

A consultant for Chevron USA points out another problem. "If the octane of unleaded is decreased, we estimate that over half of the customers who must use unleaded will encounter more engine knocking. We are sure this increased level of knocking will result in increased fuel switching (such as putting premium in a car designed for unleaded) and thus increase air pollution."

When you look at a gas pump, you should see a yellow label that looks like this.

What it means to you: How do you determine the lowest octane of gasoline on which your car will run satisfactorily? First, learn to know what minor pinging is as compared to a serious and damaging engine knock. We have all experienced pinging in a heavily loaded car we are driving uphill. We know if we back off the accelerator a bit, things smooth out. (Most of us also realize that low humidity can cause knocking in an otherwise smooth engine, and that as a car gets older it tends to knock more.)

Second, tune your car or have it done by a competent mechanic to the factory specifications.

Now check the octane rating on the gas you usually buy. Remember the pump must be labeled. If your car is not knocking, fill up the next time with the next lower octane. If it still doesn't knock too much, try one level lower.

Whether you are buying leaded or unleaded gas, the point is to find the lowest octane gas your car will run on without knocking unduly.

For a quick test of a fuel you haven't used before, drive a few miles until the engine is warmed up, come to a complete stop, then accelerate hard. If the engine is going to knock with this new fuel, it will do so during this acceleration test. This does not mean the engine will knock unduly during smooth, gentle acceleration.

Some general guidelines: Since 1971, all new cars sold in the United States must be able to use gasoline with an octane rating usually found in leaded regular. They are also capable of using unleaded gasoline.

Since the 1975 models were introduced, all cars have required the use of unleaded fuel except for a handful of imports.

In other words, if you have a 1971-1974 model car, it should be capable of burning any grade of gasoline, even though the manufacturer probably recommended that you use only regular.

Cars built before the 1971 model year could develop problems if they burn unleaded. Some of these models, particularly the big-engine cars, need leaded fuel to prevent damage to valves.

Use of regular gasoline in the cars that normally call for premium leaded fuel may cause the engine to knock more than you find acceptable. However, if you can't get your usual premium, a tank or two of regular isn't likely to do serious damage.

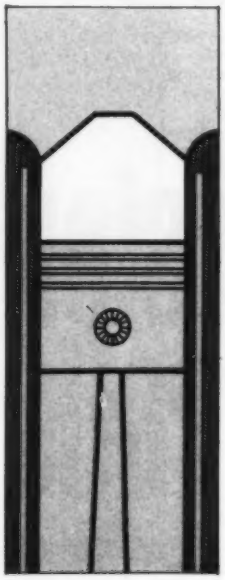
Cars that require unleaded are a different breed of cat. If you want to use a fuel other than unleaded, you'll have to gas up the car using an adaptor device because the filler neck in your fuel tank won't accept the wider nozzles on the pumps for leaded fuel. Such adaptors are widely available in accessory stores. Federal law says that you can burn leaded fuel in such a car in an emergency, but you should put only enough leaded in the tank to get you to a source of unleaded. Longer use of leaded fuel will ruin the catalytic converter's anti-pollution abilities, and eventually can plug up the converter so much as to cause back-pressure on the engine.

how gasoline produces POWER in your car

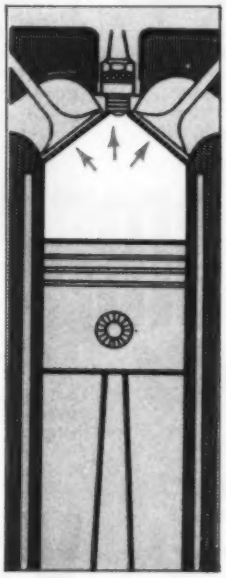
(All drawings on these pages are from the Department of Transportation)

Gasoline is largely a complex mixture of chemicals called hydrocarbons which, when ignited, combine with oxygen to burn and produce intense heat. Heat causes the gases produced by the combustion to expand. If the expansion takes place in a controlled way in the cylinders of your car, it produces safe and useful power.

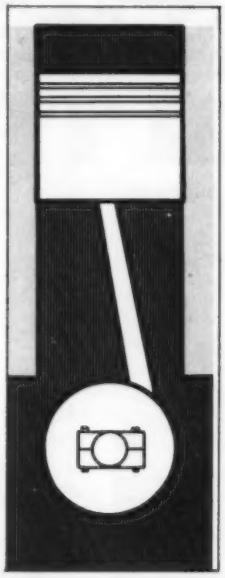
The following drawings show how most of today's automobile engines work.



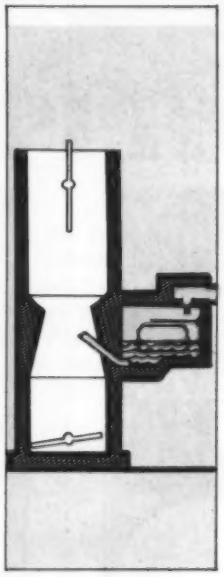
1. You have a cylinder, closed at the top, with a piston inside, free to move.



2. In the head of the cylinder are three openings for: an "intake" valve to let in gasoline vapor and air; a spark plug to ignite the gasoline/air mixture; and an "exhaust" valve to let the burned gases escape.



3. To the bottom of the piston add: a "connecting rod" pivoted at the top, with a bearing at the other end which grasps the "crank shaft" like a hand. Cars generally have four, six or eight cylinders.



4. On top of the engine is a pot-like device called a "carburetor" in which gasoline is vaporized and combined with air to form a gasoline/air mixture. As the piston moves down in the cylinder and the intake stroke begins:

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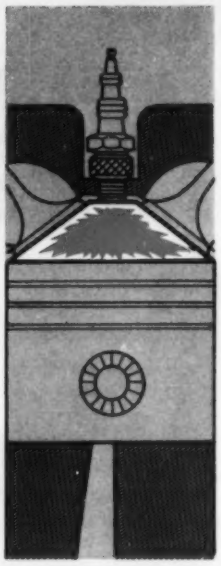
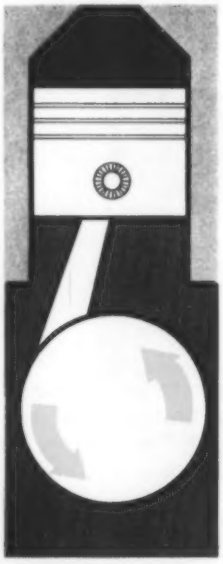
5. The gasoline/air mixture is admitted to the cylinder through the open intake valve.

6. The gasoline/air mixture is squeezed or compressed by the piston as it moves up in the cylinder.



7. Just before the piston approaches the top of its stroke, the spark plug fires and the gasoline/air mixture begins to burn.

8. The fire spreads rapidly outward, generating heat and causing the gases to expand with a smooth surge of power.



9. The expanding gases force the piston down, causing the connecting rod to turn the crank shaft.

10. The exhaust valve opens and the piston begins to move up in the cylinder, forcing the burned gases out through the exhaust system. The chamber is now ready for entry of more gasoline/air mixture, and the cycle begins again.

The rotation of the crank shaft, working through the transmission and differential gears, causes the wheels of the car to revolve and the car to move.

compression ratio

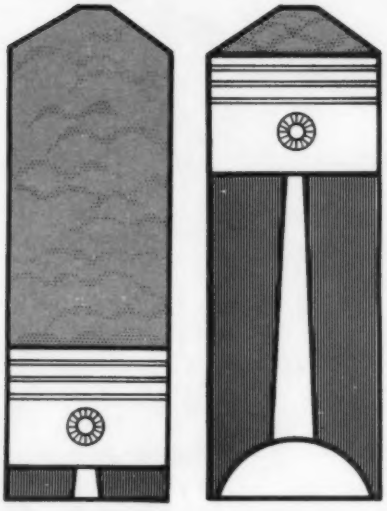
Ping you're incredible

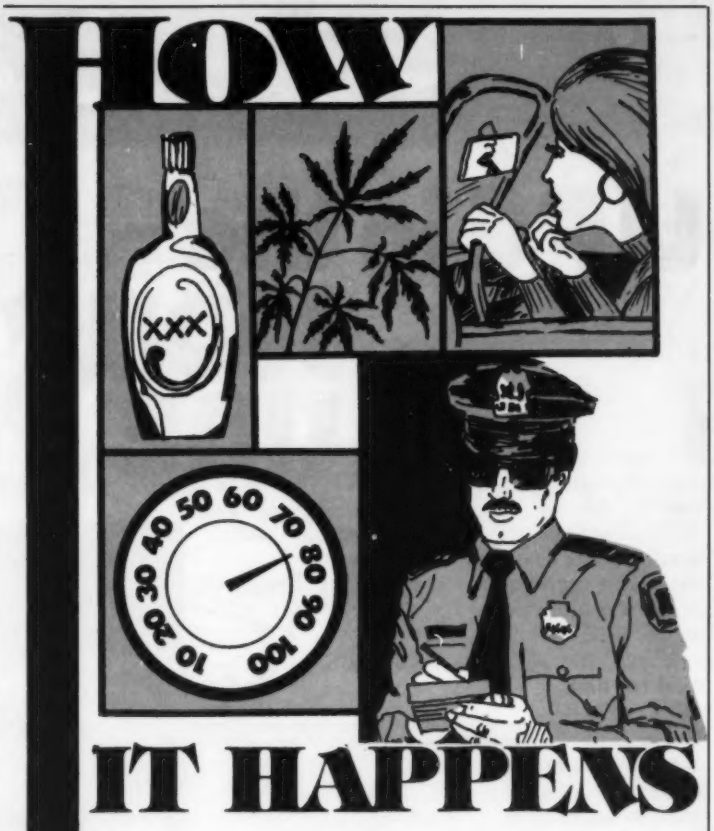
You may have wondered why some cars require gasoline with a higher octane rating than others. Probably the most important factor is the compression ratio of the engine.

To understand compression ratio imagine a piston moving in a cylinder. At the bottom of its stroke, the gases occupy a comparatively large volume. As the piston moves up, the gases are compressed between the top of the piston and the cylinder head.

The compression ratio tells you how much the gases are compressed as the piston moves from the bottom to the top of its stroke. For example, if a given cylinder has a volume of 10 units at the bottom of the stroke and only one unit at the top of the stroke, the compression ratio is said to be 10:1.

The higher the compression ratio the greater the efficiency of the engine, but also the greater the tendency of the engine to knock. Therefore, the higher the compression ratio, the higher the octane rating the engine requires to run quietly.





HOW IT HAPPENS

After missing the on-ramp to the freeway, MSgt M.G. Lover and his friend SSgt D.H. Cobrafiend try to find a way back. They cruise down a landscaped residential street – one with a wide median planted with trees and bushes. They round a curve and spot a sign that says "left lane closed ahead." All in one blink they see the sign, the reflectors on the street, and a man and his truck parked only 10 feet beyond the sign.

MSgt Lover whips into the right lane – there is no one else on the road, fortunately – and misses the parked truck by two feet. He shouts something angrily at the street worker and continues on.

Where did MSgt M.G. Lover go wrong?

1. Missing the highway entrance.
2. Driving too fast on a street with blind curves.
3. Changing lanes without looking.

Actually, he did everything wrong, but his real mistake was driving too fast on a road where he couldn't see far enough ahead to avoid sudden dangers. Had something been obstructing both lanes, he would have bought it right there.

LIFE in the SLOW LINE

If your area is like ours (Southern California) your life style has changed, and you're spending some time in a line at your friendly neighborhood service station. If this life style goes away like it did last time, will we miss it? Not likely. But no matter where you are in the U.S., you'll probably run into spot shortages the next few months.

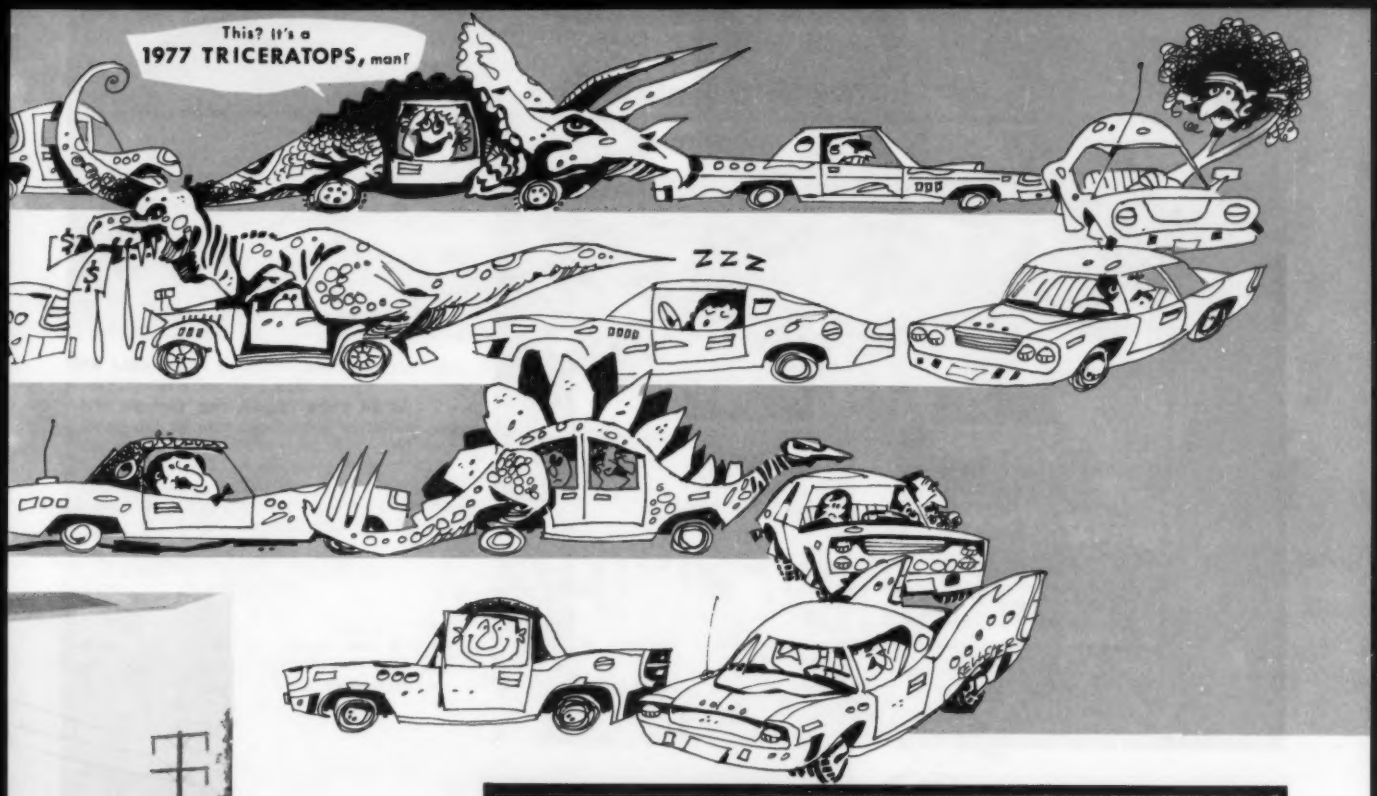
4

And wait . . .

continued

3

Where they wait . . .



(left)
By now these scenes should be familiar to many of you in the audience—closed stations in some places . . .

. . . and in others lines of cars sitting in the right lane of traffic, moving slowly toward the station for what gasoline they can squeeze out of the pumps . . .

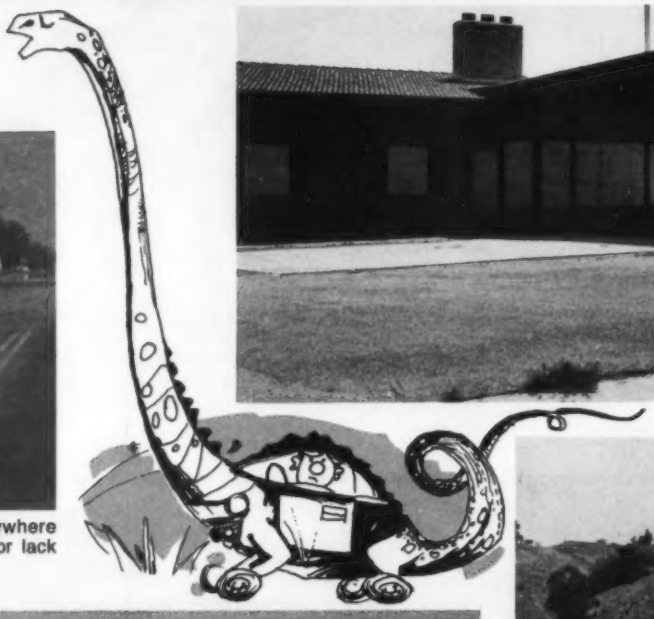
. . . with customers who wait too many days between fill-ups providing their own power to reach the fuel centers . . .

continued

. . . Until they reach the pumps and pay whatever price they must for the gasoline. Note that the register on the left has room for only three digits, while the true bill is $11.00. The price per gallon is probably lower in this photo than you're paying now—prices rise faster than we can get the magazine out.

(below)
Here's one result of the last gas shortage. This station closed permanently during the 1973 Arab oil embargo. Will a lot of others do the same this time around?

Will people be stranded everywhere as their vehicles cough to a stop for lack of fuel . . .



. . . some within shouting distance of their destination—the gas station?

What's to be done? Obviously, one thing on the Not-To-Do list is to stand by the car on the road shoulder. It's dangerous. In fact, running out of gas is dangerous for many reasons. Plan ahead! Start looking for gas when the needle drops below half-full. No sooner, but not much later either.

Will this sight become more common? (No, folks, that's not our photographer's car. This is for real.)

And so are these. Real California freeways with almost no traffic.

Traveling in luxury is fine, if you can get the gasoline to power these beauties. They may be a thing of the past.

Some are being sold at bargain prices, with the extras thrown in at no cost.

While over at Midgi-Motors, business is picking up and people who would prefer a larger car are thinking in miles per gallon.

here are a few hints

to help you through those 20- or 60-minute waits in the gas line.

■ Expand your mind: Read our van pooling article in this issue.

■ Make a list of 10 new ways to save gas this week. If you already drive with style and grace, concentrate on how to combine trips for greater efficiency per gallon.

■ Get out your gauge (you do have one?) and check the tire pressures.

■ Look at this 1973 pic and get all choked up over the good old days when gas was cheap.

■ Consider which you REALLY hate most—sitting in this line or car pooling to work every day with three other people.

■ Fight depression. Meet a few of your neighbors. You'll find a lot of interesting people in gas lines.

exercises for the backward mechanic

continued from page 12

Trying to squeeze under a car can give you cuts all over your upper body from sharp pieces of car body or chassis metal. You may also feel like a great weight is upon your chest. Why not block the wheels and use good jackstands?

In order to practice wriggling under a car without using jackstands, place the weight upon your chest and leave it there for not less than 12 minutes. For the weight, you may substitute a large child wearing golf shoes.

Reaching the passenger-side rear spark plug on an air conditioned car can really do it to ya'. You can burn your arm on the exhaust manifold, and then burn it even worse when you can't remove your arm quickly because it's stuck in the bowels of the engine compartment.

A blowtorch or soldering iron may be used instead of a candle to get you used to burning your arm on a hot manifold. You may also want to use the front burner of your camp stove for a really good burn.

Even something as simple as washing the rear window on the inside can give you twists and strains if you're not careful.

We like this one. Not only do you get to wrench your back by getting into position for the exercise, but your buddy and you may get cut when the sheet of glass breaks. May we suggest tempered glass? Oh, Yeah . . . the edges are sharp too.

Working on a running engine can lead to all sorts of complications, not the least of which is sticking your elbow into the fan blades. Also, watch out for burns and moving fan belts, particularly when working with a timing light.

(right)
Ah, yes . . . the old "grab the spark plug lead on a running engine" trick. Very painful. It's even better when you hit your head on the hood as you straighten up.

(below)
115 volts AC isn't really the same as 15,000 DC from a spark plug, but it's close enough for BYM work. This one's a real eye-opener.

With all the guarding on today's fans, you may find it necessary to partially demolish your roomie's fan guard to accomplish this exercise. Don't neglect it, though; it's an important one.

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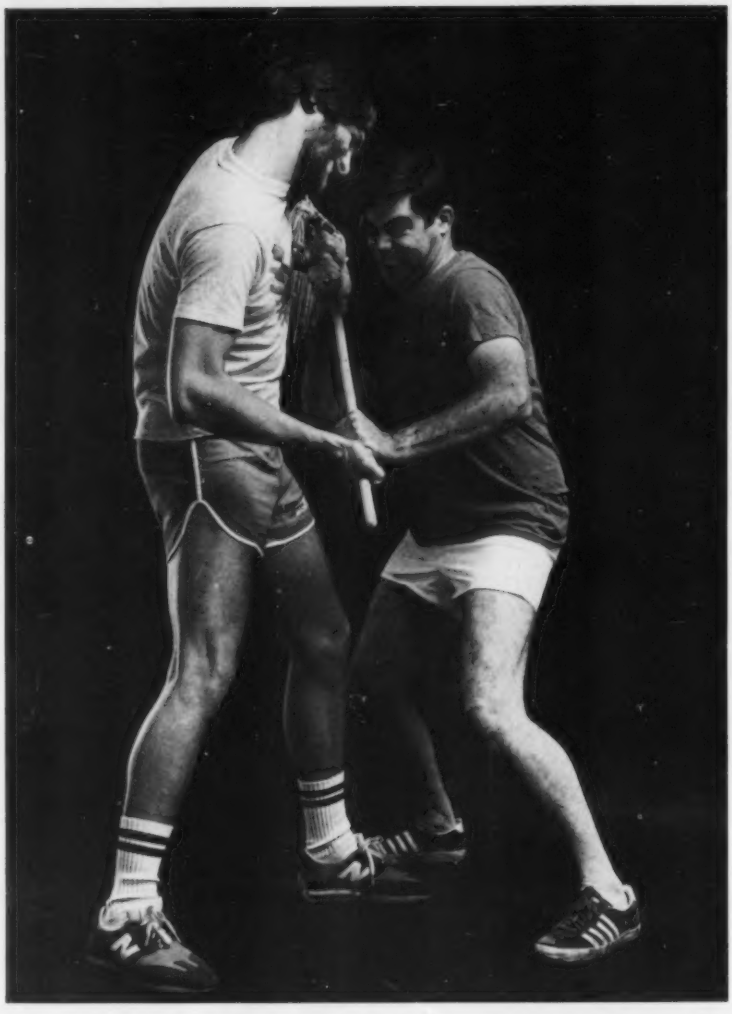
Guess what you can strain trying to loosen lug nuts? That's right . . . just about everything.



The only thing that will duplicate a twisting movement, with its power to tear muscles, is another twisting movement. The advantage of this exercise is that *two* people can practice hurting themselves. If nothing else, it'll prepare you to make action movies like Errol Flynn and Tyrone Power.

Jackstands came along when people finally figured out that bumper jacks weren't the best idea for maintenance work. This one would be even better if you happened to be working *under* the car at the time.

All you need for this one is a brick, a hard surface, and a body. Depending on the roles, this one can please both sadists *and* masochists.

So you didn't block the wheels when you used the bumper jack? Jumping back out of the way is preferrable to trying to catch the car.

Since you don't want to injure your coexerciser (at least, not unnecessarily) please provide a pillow when you practice avoiding catching things.

Yessir, bumper jacks are a lot of fun. When your hand slips off the handle as you are letting the car down, you can easily get a quick shot in the chops.

This one takes a real friend to be done properly. Well, maybe not a *real* friend . . . maybe not even a friend. Maybe the brother of the girl you last dated . . .

(left)
Try not to get in the habit of carrying tools in your pocket . . . particularly screwdriver-type tools. Back pockets are just as bad.

(right)
An ancient and honorable tradition, this Hara-screwdriver! Be sure to properly sterilize the screwdriver and have qualified medical help standing by, in case you miss.

continued

continued

Opening the cap on a hot radiator system can give you lovely burns, as well as a knock on the chin if you can't hold onto the cap of a pressurized system.

Be sure to get plenty of water up your nose with this one. To be really in shape for opening a hot radiator, try attaching the garden hose to the hot water tank at your house.

Ah, tool discipline . . . the right tool for the right job. Our hero seems to have forgotten that a pipe wrench and screwdriver aren't a mechanic's hammer and punch.

You can give yourself a heart attack or shin splints by not being in shape to jog to the parts store. This is sometimes necessary because you have purchased parts, then taken them home and torn the car apart only to find out the parts don't fit and the spouse has got your other car, and you've gotta have the car fixed and be in Cucamonga by 3:15.

This is another of our favorites. It takes only a minimum of equipment and you don't need a co-exerciser. You do, however, need a soundproof room.

(right)
Ideally, the suitcase should be filled with old issues of "The Backyard Mechanic," the sprinkler should be connected, the fan should be plugged in, and your false teeth should have an extra layer of cement.

(near right)
Trying to put in the points hold-down screw can strain your eyes. Kinda like trying to thread a needle with yarn.

(far right)
We really should have used a smaller needle, and a length of rope to get that true, crossed-eyes effect. This one'll drive ya crazy . . . we love it!

(left)
"Yeah, it sure is a nice day, Michelle. I really want to thank you for washing the car while I work on the engine. Michelle, why are you looking at me like that?"

(above)
Instead of a foot, you may use a large dog, or a rocking chair, or a full fish tank.

(left)
Working under the dash while wearing rings or watches can ruin your day. There's a lot of amperage running around under there, and while the chances of shock are pretty low, amperage from an electrical contact can melt rings and watchbands and give you a nasty burn.

It's really hard to get those rings and watches into the wall plug, but if you can do it you'll nearly duplicate making electrical contact under a dashboard. Use old jewelry, since it will probably melt.

(left)
If you forget to set the parking brake and leave the car in gear, don't be surprised if gravity has a familiar reaction on your car. Don't trip, Bunky, and don't look back!

(above)
This one is a piece of cake. Just run in place, as hard as you can, for 30 minutes. But it would be better to go outside and be chased by a hostile, domesticated animal, just to bring the fear factor up to where it would be if you were being chased by your car.

LETTERS to the EDITOR — BACKfire

STEERING SYSTEM PROBLEM

Like HMC Wallace (Jan '79 Backfire), I had directional control problems with a Chrysler product—a 1970 Super Bee.

A very noticeable pull to one side developed when I had some work done which required removal of the steering column. The steering shaft coupling detaches from the power steering box by means of a roll pin through the coupling. Excess force apparently was used to separate this coupling, damaging the steering gearbox internally.

There is a small manifold on top of the steering gearbox to which the hose from the power steering pump is attached. This manifold can be slid somewhat forward or backward to adjust the pressure balance between left and right "directions." This might be another solution to HMC Wallace's problem if careful alignment does not suffice. Unfortunately, my car had to have a new box.

No amount of alignment precision will compensate for a misadjusted pressure balance in the steering gearbox.

A word for those who must remove or work on Chrysler product steering systems. The steering shaft axial motion, created by the turning of the worm gear, is used to control pressure distribution from one side to the other. Any hard blow along the length of the steering shaft can damage this mechanism and produce very hazardous steering problems and large repair bills! If you don't know what you're doing, don't do it!

Capt Earl N. Mayfield, Jr., USAF
9 RTS/LGM
Beale AFB, CA 95903

STALE INTERSECTION

First things first, you guys have a good magazine and provide useful information.

Your article on "Intersection Etiquette" was very good and covered almost every situation possible except one which should have been covered. That is the "stale intersection or malfunctioning light" situation. By that I mean the case where you have been sitting for about 4 minutes on red and suddenly realize your red light is stuck, and the other light is green and also stuck. Tough situation. The only advice I could give is to keep your cool and watch for a reasonable opening in traffic. Then you must be so cautious about entering the intersection that the local snail beats you and hates your horn. Got any other ideas?

Mr. James L. Bozarth
OC-ALC/SE
Tinker, AFB, OK 73145

Good point. The only thing we can add is that if you're in the right lane, you should make a right turn, get into the flow of traffic, and then search for an intersection with functioning lights.

JUMP STARTS

I just finished reading your Apr '79 issue. As usual it is full of good information. However, as an electrical engineer, I have to correct an error in your article on "Jump Starts" for dead batteries. In the caption to the right-hand picture on page 13, you recommend diagnosis beyond the "jump start" suggesting, "You might have a bad cell in the battery, or a *ground* in your electrical system." I guess the author spent too much time hanging onto the terminals of a good battery. *Every* electrical system has a ground. What the author means is the system may have some point shorted (or connected) to ground. This is often referred to as being "shorted" or "grounded." The ground of the system is, of course, the frame that you so wisely advise your readers to fasten the negative lead to on the "dead" car.

With the gas crunch, how about an article on what federal and state agencies are doing to develop alternatives to the POV for getting to work (and play)? Your article on carpooling tells what the little guy can do, but what's big brother up to?

Maj Rober N. Stromberg, USAF
22702 - 58th Avenue West
Mountlake Terrace, WA 98043

Thanks for clearing up an important point. Vanpooling (this issue) is one of the things government agencies are pushing as an alternative to the POV. We're on the lookout for others, but don't see much action yet.

DRIVING MARIJUANA USERS

Thanks for the timely article on the impairment drivers encounter after the use of marijuana. It is going to be used in our drug awareness program. I would add only one thought. Because people who use marijuana do in fact suffer from an impairment, development of reliable tests to measure defined levels of marijuana intoxication/impairment, such as currently exist to detect alcohol intoxication, should be developed as soon as possible to identify those who may be operating vehicles or involved in accidents while under the influence of marijuana.

Stiff fines and corrective action similar to that required for persons apprehended for driving under the influence of alcohol should also be implemented for persons identified as driving while impaired by/under the influence of marijuana. Any action to legalize or decriminalize marijuana without considering the safety of the rest of the population by instituting programs to actively detect the marijuana-impaired driver would be a gross injustice.

Maj Lyle A. Working, USAF
AF Mil Tng Ctr
Lackland AFB, TX 78236

We keep reading that simple, roadside tests will soon be in use.

PAY FOR AIR

I have spent 2½ years stationed at North Truro AFS, Cape Cod, Mass.

For two years I have worked parttime at a local gas station.

The first year I worked there we had free air. Due to the large amount of beach buggies and 4 WD vehicles around, our yard was always filled with vehicles not buying anything and filling tires with air. This problem we could put up with, but people cutting the air hose and stealing hoses at a cost of $1.00 per foot plus couplings at $10.00 per set, gets expensive.

My second year there we put in a Nik-O-Lok Air machine. Any customers who buy anything get free air but for non-paying customers, get out your change.

This allowed us to keep costs down and give our paying customers the better service they deserve. The people who cause the trouble go down the street for free air.

It's the same old trouble. The few ruin it for the many.

A1C Peter J. Duffy, USAF
Box 311, North Truro AFS
North Truro, MA 02652

Seems like a fair arrangement.

MOTORCYCLE RIP-OFF

I have an interesting story about how a motorcycle dealership tried to rip me off.

A couple of month's ago, I went to a local dealership to buy a used 650 Yamaha. Since the bike was used, plus the fact that I had previously owned other bikes, I looked it over very well. When the dealer tried to use the electric starter the bike wouldn't turn over. So he kicked it a few times and it started. He told me the bike had been sitting in the shop for a whole winter and the battery needed a charge. I promptly and erroneously agreed.

After owning the bike for one week I had yet to get the electric starter to work. The dealer had told me he had the battery charged. On this day, one week after the purchase, I tried the electric starter and fire broke out underneath my seat. After putting out the fire I noticed that the battery cables had fused together with the starter and other electrical features. Needless to say I was infuriated. I had been suckered. *No warranty!*

Due to the fact that I had been misled, I contacted legal authorities and learned that I could have a good legal case in my favor. After relaying this info to the dealership, prompt action was taken to repair my bike.

Being in the military has its advantages and really proved so in my case. However, I would just like to warn others about how devious the dealers can be with an airman's money.

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TIRE PRESSURE CHECK

I thought I would share with you an interesting experience I had concerning tire pressures. I bought a new Plymouth Horizon in Oct '78. I am ashamed to admit that I never checked the air pressure in the tires until Apr '79. Imagine my surprise when I found all five tires inflated to 45 psi. Recommended pressure is 29 psi.

A certain amount of the difference may be attributed to the fact that the car was bought in New York and the 45 psi pressure was discovered while I was TDY in Mississippi. But I don't believe the difference in pressure can be totally explained by the change in temperature and altitude. The car must have come from the factory with the tires over-inflated. And because I didn't check the pressure, I drove the car over 4,000 miles (about 2,000 of which were at highway speeds) with the tires so grossly over-inflated.

I would recommend that anyone purchasing a new or used car make checking the tire pressure one of the first steps in their "shake down" of the vehicle. And don't forget the spare! Fortunately I learned my lesson without suffering any serious consequences, but it could have been otherwise.

I have found DRIVER to be both informative and entertaining since its inception. Keep producing this quality product.

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ADDITIONAL TIDBITS

I just finished reading your Apr '79 issue and particularly enjoyed the "Travels with Sandy" article. I'm planning a bike trip from Illinois to Maryland to Florida and return this summer. Like the problems of check cashing, she brought up some solutions to problems before they became problems to me.

I would like to make some additions to two of your articles. In "Double Clutch," don't forget your local credit union when you shop for a car. They usually have a current NADA book that they will be glad to let you look at. This will give you info like average trade-in of your bomb and the average dealer cost of the luxury liner you're looking at. Be prepared for that salesman!!

Secondly, the "Jump starts" article. Most manufacturers will recommend that you hook up the batteries and then wait a few minutes before attempting to start the dead vehicle. This will help prevent a big electrical surge that could burn out a component or two. After the dead car gets started, refrain from using lights, A/C, heater, etc. for a little while. Give your battery a chance to recuperate and your electrical system a chance to cool down.

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☆U.S. GOVERNMENT PRINTING OFFICE: 1979—683-012/9

DON'T CARRY EXTRA GAS IN YOUR CAR

DON'T STORE EXTRA GAS IN YOUR GARAGE

One gallon of gasoline can have the explosive force of 13 sticks of dynamite!

These containers are approved for carrying gas from the service station home to your power lawnmower, or from the station to a vehicle stranded a few miles away. No container is safe for carrying gas long distances in your car. There are almost 1½ million rear-end collisions a year in this country. Would you want a container of gasoline in the trunk when somebody slammed into you from behind? Collision isn't the only risk, either. A short in a tail light or brake light can set off an inferno before you know what's happening.

Do not use glass, plastic or rusted metal containers for lawnmower gas. Use a proper container like one of these and keep it in a well-ventilated area, away from flame and spark sources. Gas vapors expand and can split the seams of an unvented can or plastic container, or the expansion can cause vapor leakage from a vented "safety" can.

When the gas scare hit California last April, the Service Station Association estimated that 40 million gallons of gas were quickly stored in portable containers in cars and homes throughout the state. That compared to 80 million gallons in the underground tanks of the service stations. Doesn't make sense, does it?